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PROFILES
of
Machines for Post-Harvest Technological Operation and Processing of Oilseeds

OIL TECHNOLOGICAL RESEARCH
INSTITUTE
ANANTAPUR

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PREFACE

The Oil Technological Research Institute, Anantapur has developed over years, machinery and equipment by eqinnovative, adaptative and simulative paths for processing of oilseeds from cleaning to extretion stages not only to develop the subject but to help entrepreneur and industrialists in the field. While the work is scattered in hundreds of research papers published in journals, the equipment are situated in the institute. For the benefit of the researcher, the entrepreneur, the industrialist and the documentator, all the equipment are described in one place as profiles with illustrations of the prototypes. The equipment are reopen for exhibition and demonstration at the Institute.

24-5-83
Oil Technological
Research Institute
ANANTAPUR

S.D. THIRUMALA RAO
Director

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1. Hand-operated drum dryer

1. Name of the machine : Hand-operated drum dryer.

2. Purpose of the machine: To dry freshly harvested groundnut pods. This machine can also be used for drying sesameseed, mango stones and for stabilzing ricebran.

3. Description of the machine. : The machine consists of a drum 93 cm. in in length and 50 cm diameter made out of 22 gauge iron sheet. The drum revolves on a lever which is hand-operated. Beneath the drum, a perforated sheet is fixed being a provision for direct heating with firewood or charcoal. The drum is provided with a feeding hole and a hole for fixing a thermometer. At one end, a vent is provided for the escape of moistureand volatile gases. The capacity is 0.17 m3.

4. Test data : i) Groundnuts with a moisture content of 23% were dried to a moisture of 9% within a period of 8 hours when dried at 80°C. The pods keep well without much rise in FFA.

ii) Mango stones with an initial moisture content of 42% could be brought down to 15% within 2 hours and the stones keep well without rise in FFA.

iiii) Ricebran can be heat-stabilized at 90°C for 1/2 hour without rise in FFA.

5. Economics : The cost of the machine Rs. 750.

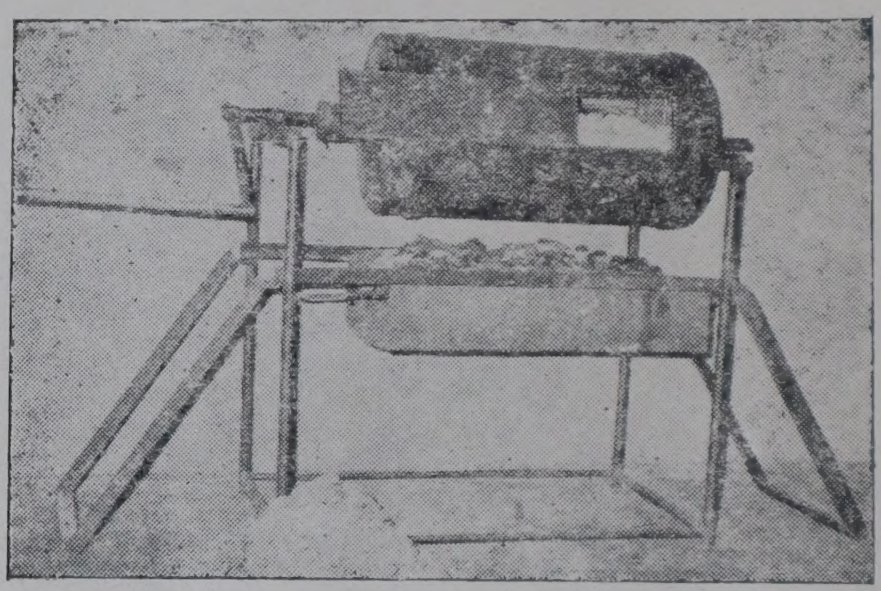

Fig 1: HAND OPERATED DRUM DRYER

2. Steam heated continuous rotary dryer

1. Nam of the machine : Rotary dryer.

2. Purpose of the machine : Accelerated drying of the freshly harvested groundnut pods. This machine can also be used to dry freshly harvested seasame seed and other grains also.

3. Description of the machine. The dryer consists of a barrel, open at both ends (internal area 7 sq. metres) rotating horizontally around a closed shell into which live steam generated in a boiler is admitted. The slope of the barrel can be varied. The inner surface of the barrel is lined with angles so as to make the seed take a tortuous path form the point of feeding to that of discharging. The machine works contin ously.

4 Test data : Picked groundnuts having 22 per cent moisture were dried to 7 per cent moisture content in 18 hours. The capacity of the machine is 2 tonnes per day.

5 Economics : The cost of the dryer Rs 12,000

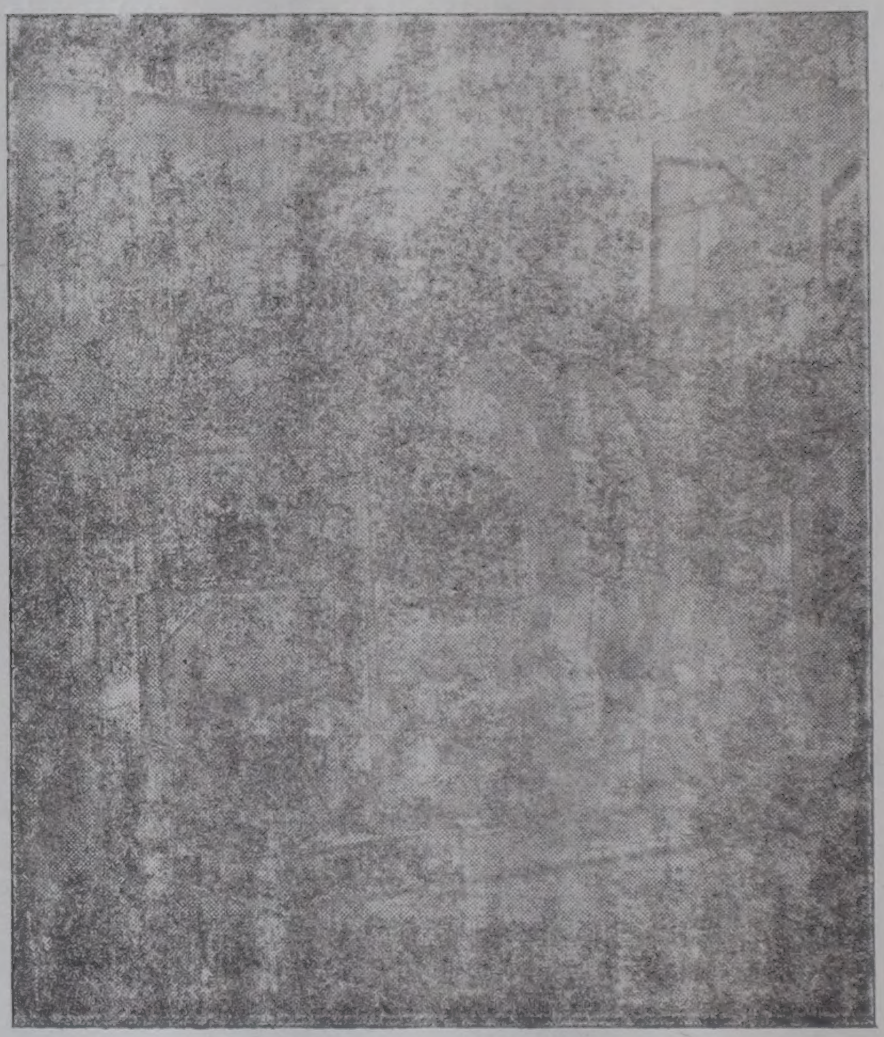

Fig 2: STEAM HEATED CONTINUOUS ROTARY DRYER

3. Continuous belt type groundnut decuticling and degerming machine

1. Name of the machine : Decuticling and degerming machine.

2. Purpose of the machine : To decuticle and to degerm groundnut kernel.

3. Description of the machine : The equipment consists of three rollers over which an endless belt of rough texture is moving. The tension of the moving belt can be varied by adjustment of the middle roller. The rollers operate at a surface speed of 75 metres per minute. Another belt is fixed over the moving belt in such a way that one end of it is tightly attached to an adjustable mild steel flat while the other end traverses the surface of the equipment over the moving belt and left loose with provision to hang weights in order to increase or decreas the tension of the stationary upper belt. The machine works mechanically and continuously with 0.5 H P motor.

4 Test data : The skin removal was found to be 90 per cent and germ removal was 60 per cent. The capacity is 2 tonnes per day.

5 Economics : The cost of the machine, Rs 2,000.

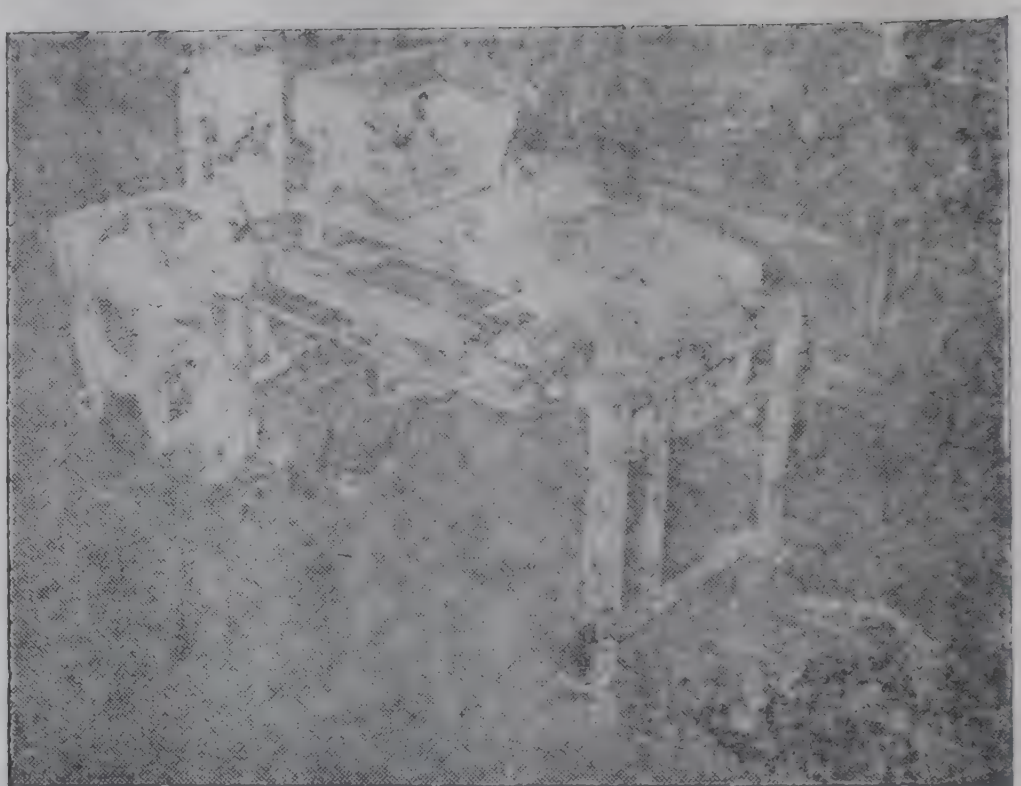

Fig 3 : CONTINUOUS BELT TYPE GROUNDNUT DECUTICLING AND DEGERMING MACHINE

4. Disc huller type groundnut decuticling and degerming machine

1. Name of the machine : Decuticling and degerming machine.

2. Purpose of the machine : To decuticle and to degerm groundnut kernel.

3. Description of the machine. : The machine is a disc huller with wooden discs. One of the discs is static and the other rotating at a speed of 600 rpm. by a mechanical drive (15 H.P. motor). The clearance between the surface of the discs can be varied. A shaker separator with suitable screens and a cyclone separator are synchronized with the machine to get a continuous performance.

4. Test data : The capacity of the machine is 8 tonnes per day. The degree of decuticling is 99% and the degree of degerming is 95 percent under optimum conditions of clearance, screen arrangement and cyclone separation.

5. Economics : The cost of the entire set up will be about Rs. 45,000. This equipment substitutes the imported machinery for decuticling of groundnut.

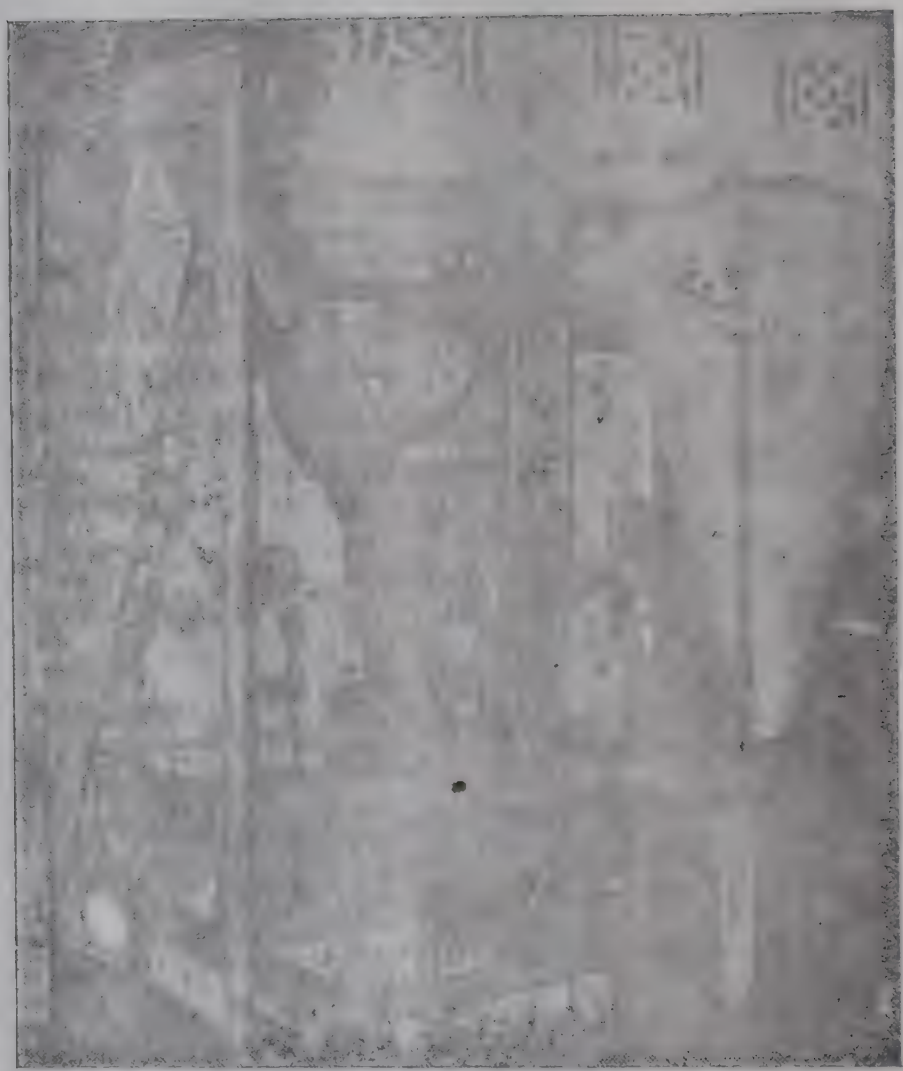

Fig 4 · [illegible] Decticling and Degermning Machine.

5. Roller type groundnut decuticling and degerming machine.

1. Name of the machine .. Decuticling and degerming machine.

2. Purpose of the machine .. To decuticle and to degerm groundnut kernel.

3. Description of the machine. .. The machine comprises a beater having horizontal channel grooves and with or without steps around the surface. This beater rotates coaxially along a grate which has a semicircular shape and in the form of a trough and is formed of a perforated sheet or a number of mild steel flats placed horizontally on their edge or mild steel round bars with the spacings between each adjusted to the desired width. The clearance between the grate and roller may be such that the roller rotates freely without any obstruction from the grate. An inclined plane is fixed directly below the grate. The plane may be with or without perforations and may be a stationary or a shaker type. A fan is fixed towards the downward slope of the inclined plane. The beater and the fan can be driven either manually or mechanically.

4. Test data .. .. The capacity of the machine is 12 tonnes of groundnut kernel per day. The degree of decuticling and degerming are 95 per cent and 70 per cent respectively.

5. Economics.. .. The cost of the machine is Rs. 4,000 but the accessory machines like size grader and roaster would cost about Rs. 40,000. This equipment substitutes the imported machinery for decuticling groundnut.

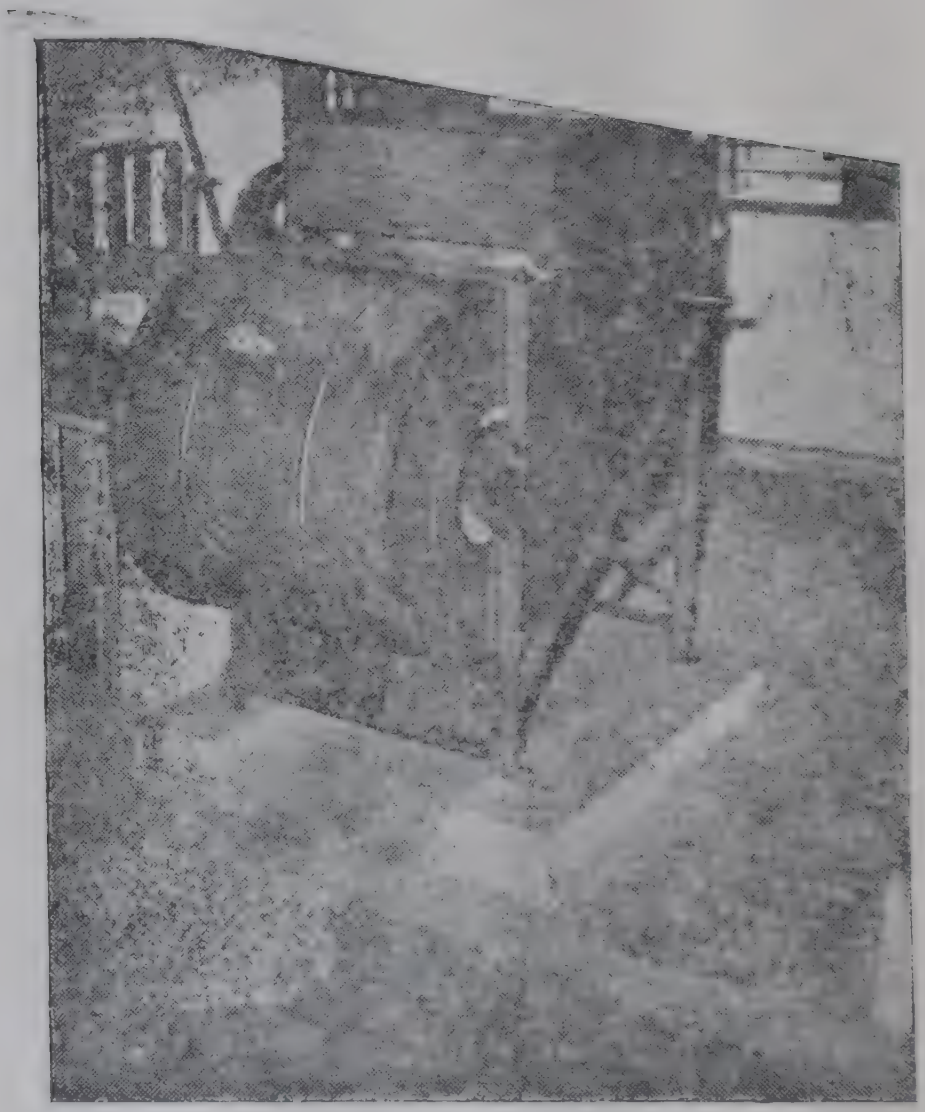

FIG 5 :—ROLLER TYPE GROUNDNUT DECUTICLING AND DEGERMING MACHINE.

6. Roller type combined groundnut decorticating, decuticling and degerming machine.

1. Name of the machine .. Roller type, combined groundnut decorticating, decuticling and degerming machine.

2. Purpose of the machine. . To decorticate groundnut pods, decuticle and degerm the kernels in a single step.

3. Description of the machine. .. The machine is a conventional groundnut decorticator with suitable modifications to suit the purpose. It is the same machine as in 5.

4. Test data .. .. The capacity of machine is 8 tonnes per day. The degree of decortication is 100 per cent, decuticling 97 percent and degerming 92 per cent. The yields are decuticled and degermed seed 68 per cent, germs and grits 4 per cent and shells and cuticles 28 per cent.

5. Economics.. .. Same as in machine 5.

7. Beater type combined groundnut decorticating, decuticling and degerming machine.

1. Name of the machine ..	Beater type combined groundnut decorticating, decuticling and degerming machine.
2. Purpose of the machine..	To decorticate groundnut pods, decuticle and degerm the kernels in single step.
3. Description of the machine.	.. It comprises a beater having projecting-rods and rotating in a vertical plane coaxially inside a trough. The shells are broken, the cuticles are peeled off, the kernels split into halves and the germs knocked off from the split kernels and separated from tthe other constituents of themixed produc by means of a fan blower fixed in the machine.
4. Test data ..	.. The capacity of the machine is 8 tonnes per day. The degree of decortication is 100 per cent, decuticling 97 per cent and degerming 92 per cent. The yields are decuticled and degermed seed 68 per cent, she sll4sti skins 28 per cent and germs and gr and per cent.
5. Economics..	.. The cost of the machine with motor Rs. 8,000.

8. Infrared moisture testing device.

1. Name of the machine .. Infrared moisture testing device.

2. Purpose of the machine.. To determine the moisture content of the groundnut before purchase at the *mundi* or in the oil mill.

3. Description of the machine. .. The device consists of a 250 W infrared heating bulb working on 220-250V fixed vertically to a retort stand. This overlooks an aluminium pan of 15 cm. diameter placed on a tripod stand or on a triple beam balance. The bottom surface of the bulb can be adjusted to the desired heights of 7-13 cm. from the pan.

4. Test data .. .. The moisture can be read upto 30 percent directly. The time varies from 30-60 minutes.

5. Economics.. .. The cost of the device with accessories including a simple physical balance is Rs. 250.

The device should not be compared with costly proprietory units based on the same principle that have come into Indian market only in the last few years. Ours is a cheap device published a decade ago and any small oil miller can setup this in his mill or at the purchase point of the seed (*i.e.*,) at *mundi*.

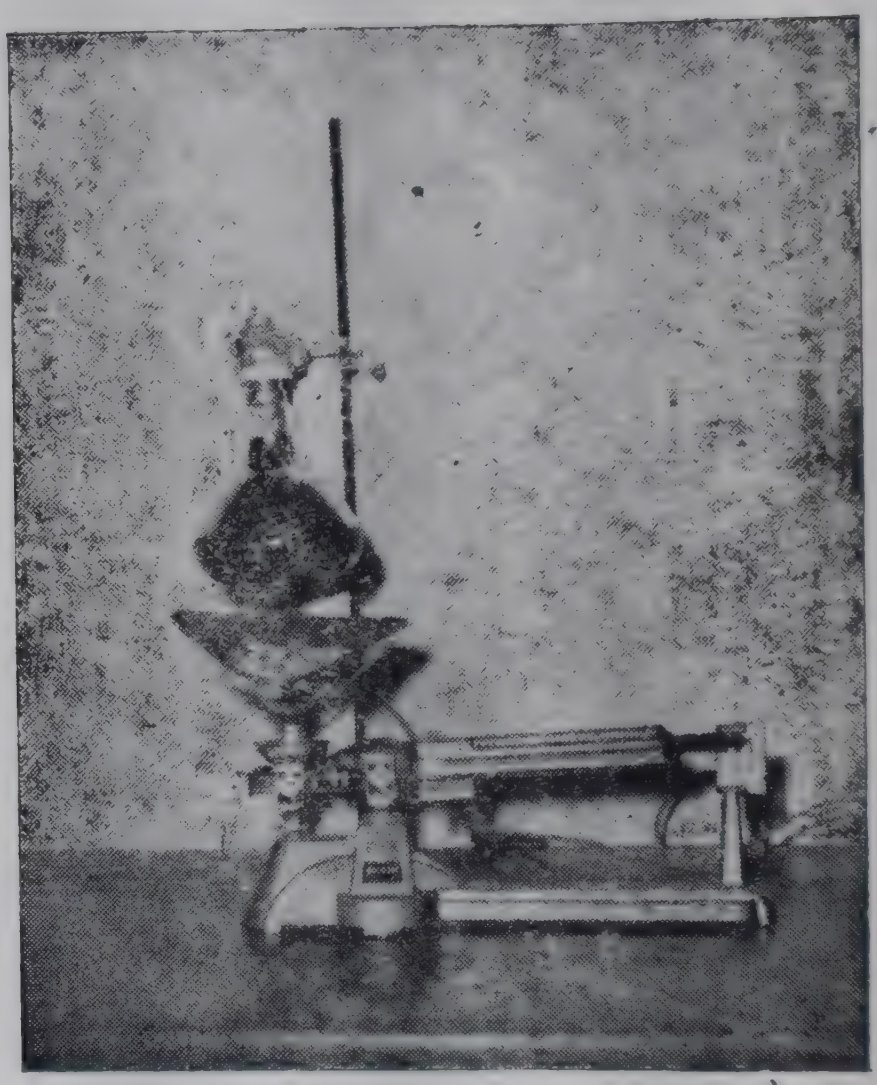

FIG 6 : INFRARED MOISTURE TESTING DEVICE.

9. A kit for field testing of moisture in groundnut pods.

1. Name of the machine .. A field moisture testing device for groundnuts.

2. Purpose of the machine.. To determine the moisture content of harvested groundnuts or groundnuts to be sold in the field or at the *mundi* where electricity and skilled technical hands are not available.

3. Description of machine.. The device consists of a conical tower open at both ends and made of galvanized iron sheet (24 gauge). The height of the tower is 21 cm. and the diameters are 10.5 cm. and 7 cm. at the bottom and at the top respctively. Holes of 1 sq. cm. area are made around the bottom rim of the tower. A wire gauge is fixed inside the tower about midway of the height of the tower. Two semicircular plates of galvanized iron which move in a horizontal plane are fitted to a hinge from the lid of the unit meant to control the hot draught of air from below. A thermometer holder is also provided at the top by means of separate galvanized iron or tin strip. A non-conducting wooden handle is fixed to the tower at the middle.

4. Test data .. This unit is applicable to read the moisture of 4-40 per cent within 30 minutes. It can be carried as a kit in a box.

5. Economics.. .. The cost of the kit, Rs. 200.

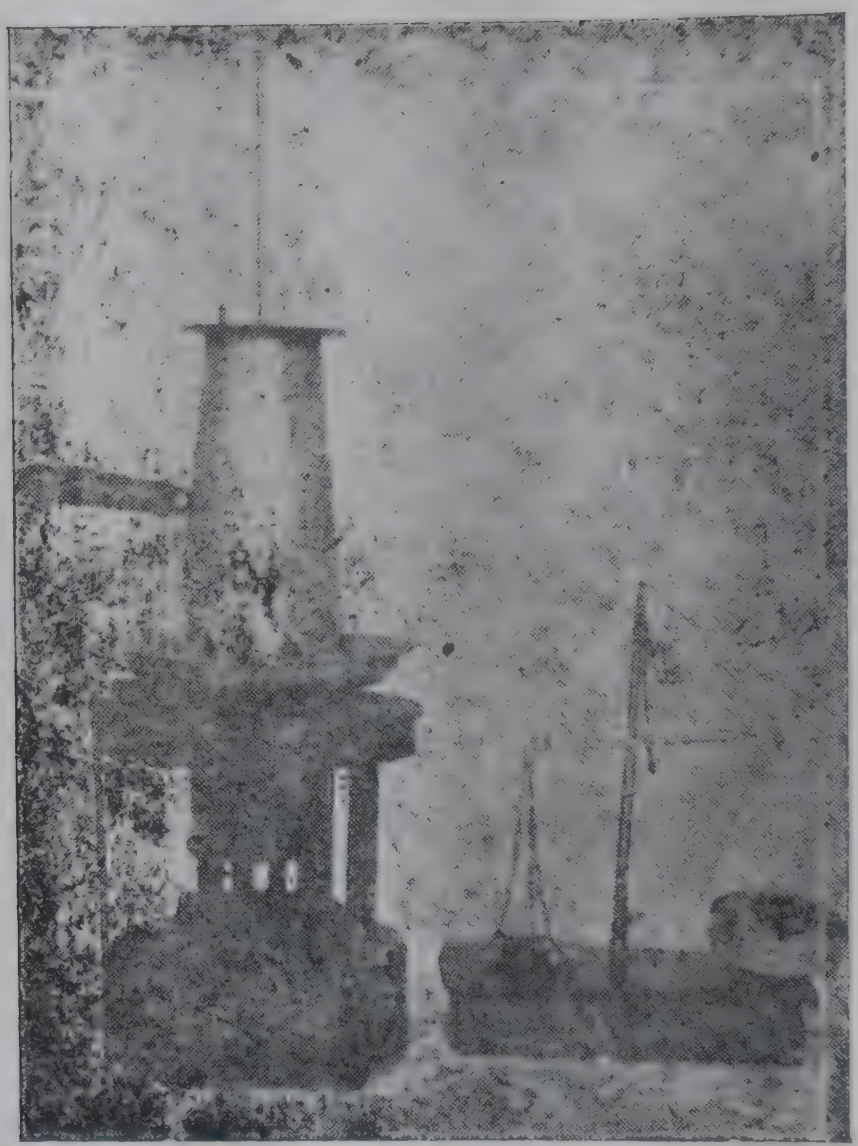

Fig 7 :— A KIT FOR FIELD TESTING OF MOISTURE IN GROUNDNUT PODS

10. Cottonseed dehuller using wooden discs.

1.	Name of the machine	Cottonseed dehuller (wooden disc model)
2.	Purpose of the machine.	To dehull either whole or delinted cottonseed and to separate the hulls, meats and powder.
3.	Description of the machine.	The dehuller consists of two wooden discs of 46 cm diameter each and 2.5 cm thickness enclosed in a metallic case. One of the discs is stationary while the other is rotating. The distance between the two discs is adjustable by means of a lever arrangement which makes the rotating disc move forward or backward. The seed is fed to the centre of the rotating disc by means of a hopper situated above the stationary disc and which opens at the centre. The fractions are separated by means of a suitable wire mesh screens arranged on shaker and cyclone collector. This is the Bauer dehuller in which steel discs are replaced by wooden and emery discs.
4.	Test data	: In case of medium and high-lintered seed,. the performance of wooden discs is comparable to that of original steel discs. The average yield of coarse meats in both wooden discs and steel discs is around 30 percent.
5.	Economics	: Wooden discs although wear and tear is more are cheaper and can be manufactured locally.

Fig 8 :—COTTONSEED DEHULLER USING WOODEN DISCS.

11. Continuous belt type cottonseed delinter.

1. Name of the machine– Continuous belt type cottonseed delinter.

2. Purpose of the machine. - To delint dry acid treated cottonseed.

3. Description of the machine. - The equipment consists of three rollers over which an endless belt of rough texture is moving. The tension of the moving belt can be varied by adjustment of the middle roller. The rollers operate at a surface speed of 75 metres per minute. Another belt is fixed over the moving belt in such a way that one end of it is tightly attached to an adjustable mild steel flat while the other end traverses the surface of the equipment over the moving belt and left loose with provision to hang weights in order to increase or decrease the tension of the stationary upper belt. The machine works mechanically and continuously with 0.5 H.P. motor.

4. Test data – Residual lint in the cottonseed came down from 9% to 2%.

5. Economics - The cost of the machine, Rs. 2,000

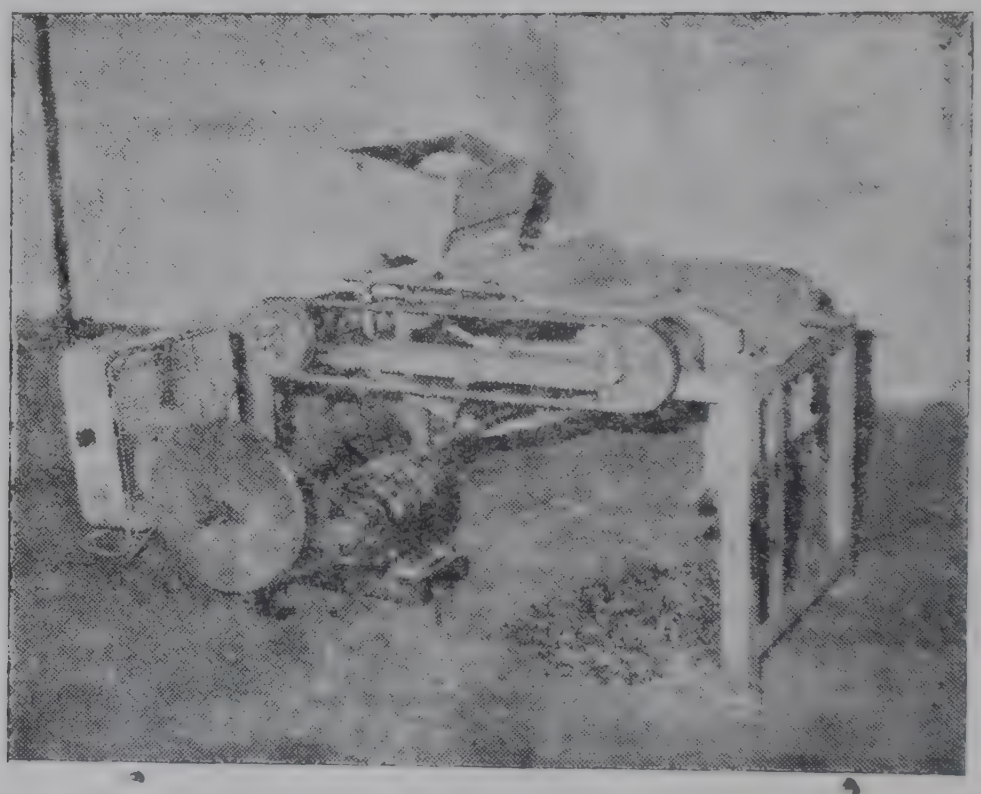

Fig 9 :—CONTINUOUS BELT TYPE COTTONSEED DELINTER.

12. Continuous moving belt manual thresher for sunflower head.

1. Name of the machine - Sunflower seed thresher.

2. Purpose of the machine. - To thresh the sunflower heads.

3. Description of the machine. - The machine consists of a moving belt made out of rough coir mat or mild steel wire mesh. The machine is fitted with a motor and fan. The dimensions of the machine are length 110 cm, and width 60 cm. Same as Fig 9.

4. Test data - The capacity of the machine is 200 kg. sunflower heads per day. The threshing data are bold seed 35%, spurious seed and chaffy material 15%, and deseeded heads 50%.

5. Economics - The cost of the machine including motor, Rs. 2,000

13. Mechanical sunflower thresher.

1. Name of the machine - A continuous mechanical sunflower thresher.

2. Purpose of the machine. - To thresh sunflower heads for recovery of seeds.

3. Description of the machine - The machine comprises a beater having horizontal channel grooves and with or without steps around the surface. This beater rotates coaxially along a grate which has a semicircular shape and in the form of a trough and is formed of a perforated sheet or a number of mild steel flats placed horizontally on their edge or mild steel round bars with the spacings between each adjusted to the desired width. The clearance between the grate and roller may be such that the roller rotates freely without any obstruction from the grate. An inclined plane is fixed directly below the grate. The plane may be with or without perforations and may be a stationary or a shaker type. A fan is fixed towards the downward slope of the inclined plane. The beater and the fan can be driven either manually or mechanically. Same as Fig. 5

4. Test data - Depending upon the driage of the sunflower heads and spacing in the grate, the machine yields 46 percent seeds, 30 percent deseeded heads and 24 percent chaffy plant material. The capacity of the machine is 3 tonnes of sunflower heads per day.

5. Economics - The cost of the thresher excluding motor. Rs. 2,500

14. Sunflower decorticator.

1. Name of the machine - Sunflower decorticator.

2. Purpose of the machine. – To decorticate sunflower seed and to separate hulls from meats.

3. Description of the machine. - The machine is a disc huller with emery discs. One of the discs is static and the other rotating at a speed of 600 rpm. by a mechanical or suitable drive (15 H.P. motor). The clearance between the discs can be varied. A shaker separator with suitable mesh screens and a cyclone separator are synchronized with the machine to get a continuous performance.

4. Test data - Under optimum conditions, coarse meats of 70 percent, fine meats of 11.5 per cent and hulls of 17.5 per cent yield were obtained. The capacity of the machine is 8 tonnes of seed per day.

5. Economics - The cost of the machine, Rs. 40,000

Fig 10 :—SUNFLOWER DECORTICATOR.

15. Safflower dehuller.

1.	Name of the machine	Dehuller *cum* separator.
2.	Purpose of the machine.	To dehull saffilower seed and to separate the hulls from the meats partly or wholly.
3.	Description of the machine.	The machine is a disc huller with steel discs. One of the discs is static and the other rotating at a speed of 600 rpm by a mechanical or suitabl drive (15 H.P. motor). The clearance between the discs can be varied. A shaker separator with suitable mesh screens and a cyclone separator are synchronized with the machine to get a continuous performance.
4.	Test data	.. Under opitmum conditions of the moisture content of the seed and clearance between and speed of the discs, the yield of hull fraction is 34-38 percent containing 86-100 percent of pure hulls. Meats and meat powder containing as low as 5 percent of hulls can also be obtained.
5.	Economics	.. The cost of the machine, Rs. 20,000

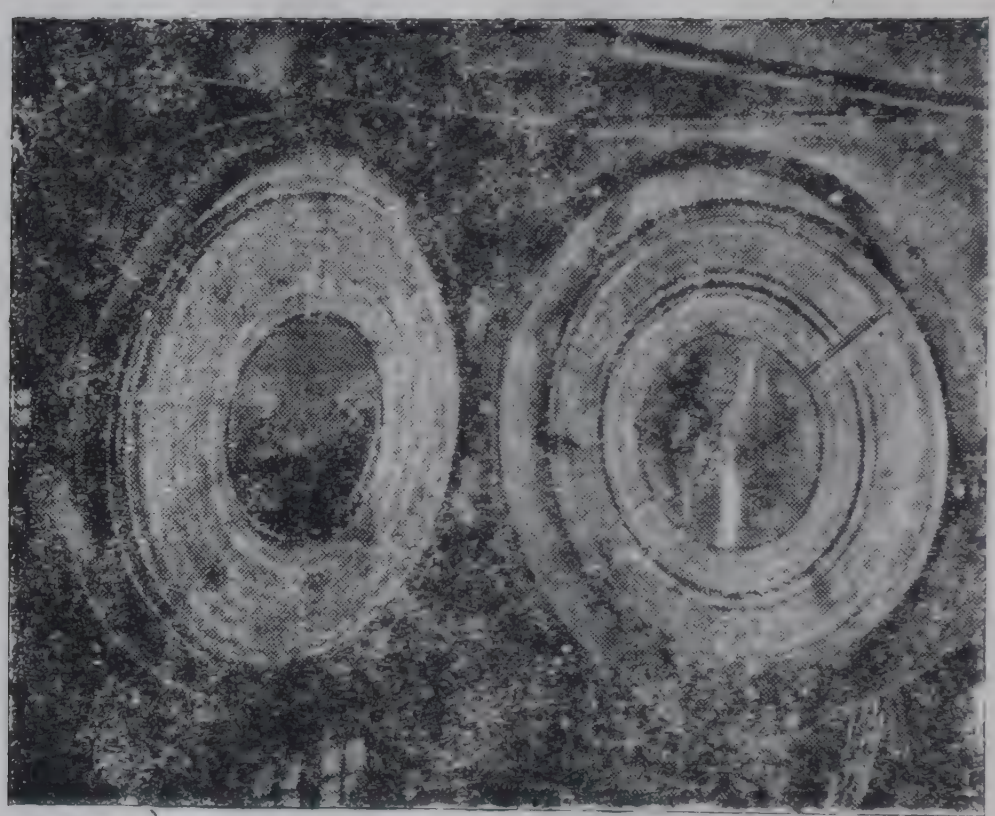

Fig 11 :—SAFFLOWER DEHULLER.

16. Grinder dehuller for safflower seed.

1. Name of the machine — Grinder dehuller

2. Purpose of the machine. — To dehull safflower seed.

3. Description of the machine. — The equipment consists of two grinding stones one on the top of the other. The top stone revolves horizontally by a shaft and pulley arrangement driven by 5 H.P. motor. There is provision for feeding at the centre of grinding stones. The dehuller seed comes out of the spout provided at the side. For the separation of hulls, separate arrangement has to be made.

4. Test data .. The degree of dehulling is satisfactory. The capacity of the machine is 3-5 tonnes per day.

5. Economics .. The cost of the machine, Rs. 2,000.

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Fig 12 :—GRINDER DEHULLER FOR SAFFLOWER SEED.

17. Sesame seed dryer.

1.	Name of the machine	Conveyor trough dryer.
2.	Purpose of the machine.	To dry wet or freshly harvested sesame seed
3.	Description of the machine.	The dryer consists of screw conveyor provided with a steam jacket. The conveyor rotates at 4 r.p.m. by means of a—shaft and pulley assembly run by a motor. There is a hopper at one end and a discharge at the other end.
4.	Test data	.. The moisture level of the sesame seed was brought down from 19 percent to 10 percent and from 14 percent to 7 percent. The capacity of the unit is 1000 kg. per day.
5.	Economics	.. The cost of the dryer, Rs. 5,000.

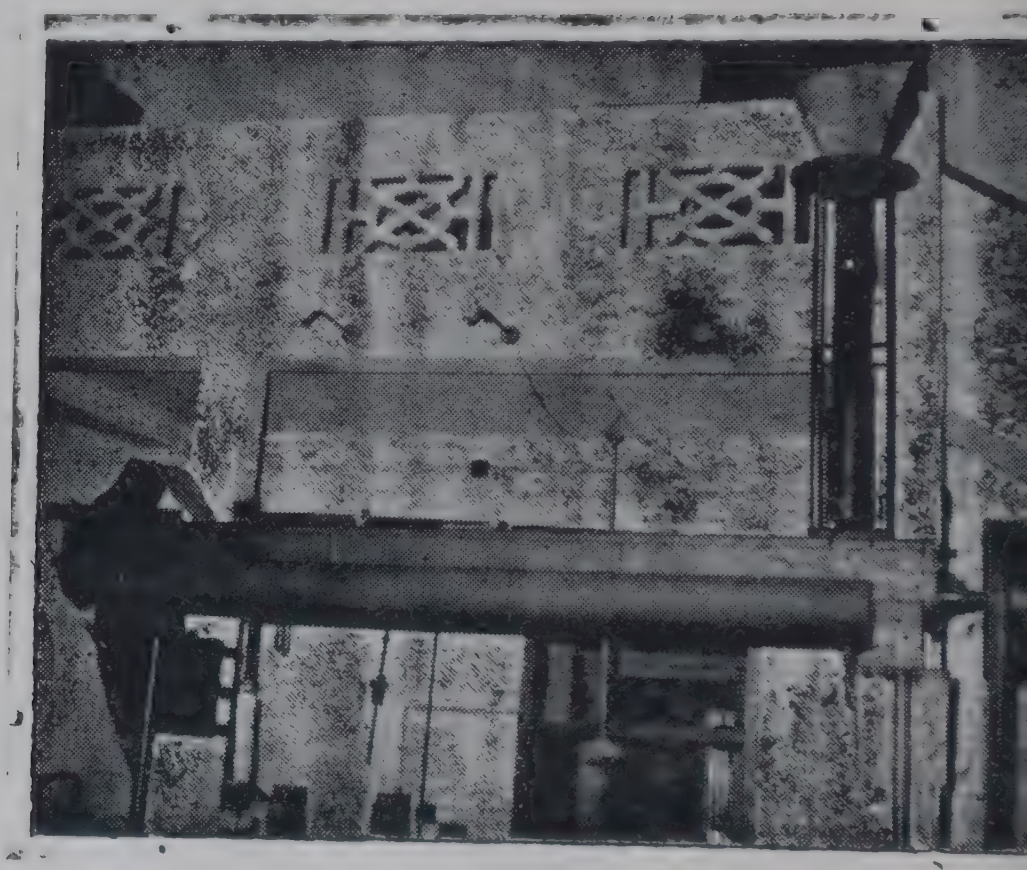

Fig 13 : SESAME SEED DRYER

18. Disc type sesame seed decuticle.

1. Name of the machine: Sesame seed decuticling equipment

2. Purpose of the machine; To decuticle sesame seed

3. Description of the machine: The machine is a disc huller with emery discs. One of the discs is static and the ot her rotating at a speed of600 rpm by a mechanical or suitable drive (15 H. P. motor). The clearance between the discs can be varied. A shaker separator with suitable mesh screens and a cyclone separator are synchronized with the machine to get a continuous performance.

4. Test data: The degree of decuticling under optimum conditions of the speed of the disc, clearance between the discs, was 95 to 100 percent.

5. Economics: The cost of the main equipment i.e, disc huller is Rs. 5, 000 Auxiliary equipment like trays, showers and dryer are not included.

The process is patented *Indian Patent* 110812

19. Screw press type decuticler for sesame seed

1.	Name of the machine	: Continuous mechanical sesame seed decuticler.
2	Purpose of the machine	: To decuticler sesame seed
3.	Description of the machine	: The machine consists mainly of a single chamber machanical screw press. By running the wet seed under nil pressure, decuticling of sesame seed is effected.
4.	Test data	: 100 percent decuticling effect is obtained. The capacity of the machine is 5 tonnes of seed per day.
5.	Economics	: This is not an *adhoc* machine. It is only an adaptive technology from the existing conventional machinery. The cost of the machine is Rs. 25,000 Auxiliary equipment like trays, showers, dryer are not included.

The process is patented under *Indian Patent* 134030

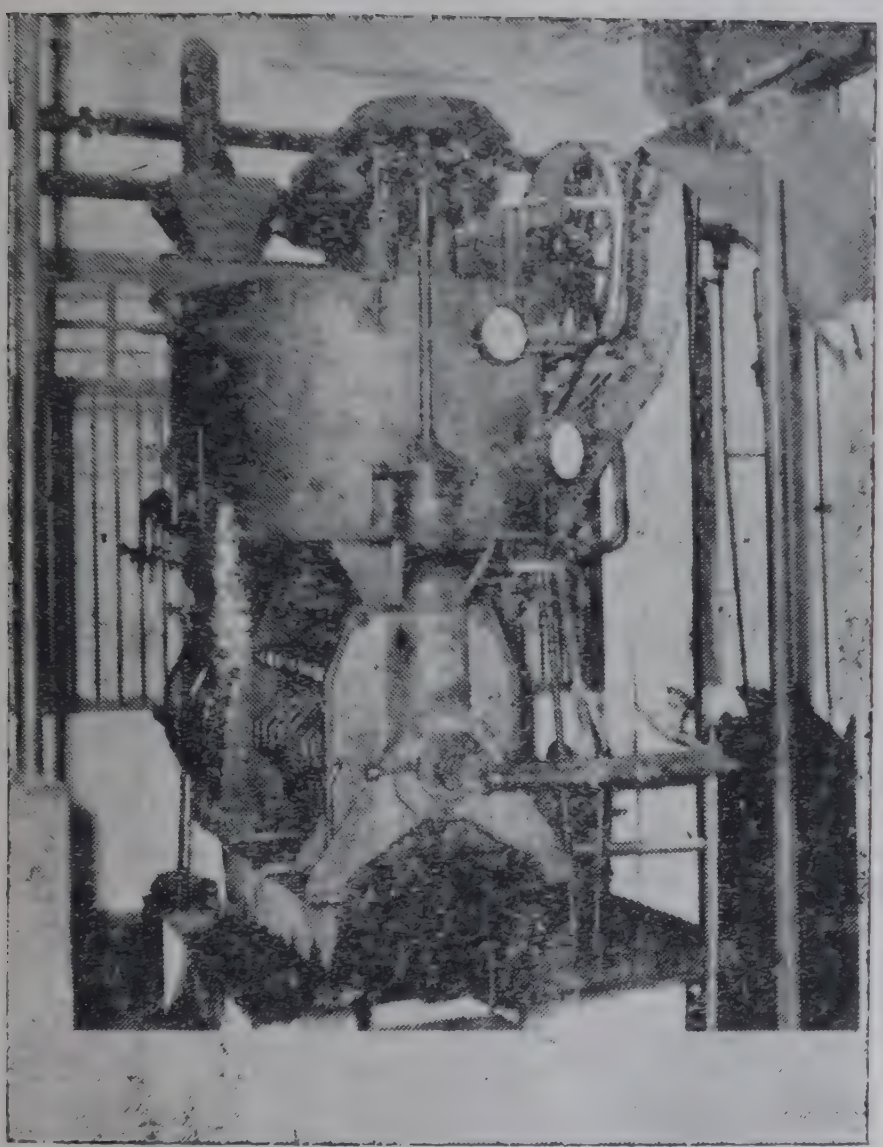

Fig 14 : SCREW PRESS TYPE DECUTICLER FOR SESAME SEED

20. Black soybean dehuller

1 Name of the machine: Soybean dehuller

2. Purpose of the machine: To dehull black soybean and to separate the hulls from meats.

3. Description of the machine : The dehuller consists of two emery discs of 46 cm diameter each and 2.5 cm. thickness enclosed in a metallic case. One of the discs is stationary while the other rotating. The gap between the two discs is adjustable by means of lever arrangements by means of which the rotating disc can be moved forward or backward. The seed is fed to the centre of the rotating disc by means of an hopper situated above the stationary disc and this opens at the centre rotating disc. The mixturse of meats, hulls and kernel powder, if any, are separated by passing the mixture over suitable perforated screens arranged on the shaker separator and cyclone collection. To separate uncut seed from dehulled seeds mostly obtained as splits, screen withslot of width 2.38 mm arrangesd in a random manner width wise in the path of taversidng meats should be used.

4. Test data : The percentage yield of pure meats is 82 to 84, of hulls is about 9 to 9.5.The dehulli ng performance is 98 percent.

5. Economics : Emery discs are not costly and can be got manufactured locally.

21. Mini hand operated salseed decorticator

1. Name of the machine: Mini salseed decorticator

2. Purpose of the machine : To decorticate salseed in small quantities

3. Description of the machine : It is small portable and hand operated decorticator. It is essentially a *Kalyan* type groundnut decorticator. It consists of a roller type beater, a trough like grate with spacings and fan blower to separate the shells and kernels. In operation the seeds fall into the trough and rolled against the grate by the revolving beater and are instantly shelled. The shells and kernels, both broken and unbroken are immediately forced down through the openings in the grate on to an inclined plane from where the shells are blown away by the fan. The beater made of cast iron has channel grooves on the external surface which help in rolling and decorticatig the fruit. A wooden beater also functions equally effectively. The grate which has a semi-circular shape is formed of a number of mild steel flats placed horizontally on their edges, the spacings between each edge being adjusted to 6.35mm. A trough made of round bars instead of flats can also be used. The fan is mounted on a steel axis which revolves on a pair of bearings at both the ends. The blades of the fan made of iron sheets are bolted to the axis. The axis is fitted with a pulley on one end and it is driven by a pulley fixed at the end of the beater shaft on the same end. The bigger pulley with a handle acts as a hand driven driving wheel. The beater and the fan run at different speeds in view of the different diameters of two pulleys. At a normal manual working of the driving wheel the speed of the fan will be about 800 r.p.m.

4. Test data : Degree of decortication 90%. Separation of husk from the mixture is sharp. The capacity of the machine is 1-1/2 tonnes per day.

5. Economics : The cost of the machine, Rs. 500.

Fig 15 : MINI HAND OPERATED SALSEED DECORTICATOR

22. Power driven mini salseed decorticator

1. Name of the machine . . Power driven mini salseed decorticator.

2. Purpose of the machine . . To decorticate salseed in small quantities.

3. Description of the machine . . The unit is a miniature of that given in (23).

4. Test data . . The capacity is 2 tonnes of sal fruit per day. The decorticated fraction obtained in a single pass contained 96% kernels and 4% hulls. The degree of decortication was cent per cent.

5. Economics . . The cost of the decorticator with motor Rs. 2,000.

Fig 16 : POWER DRIVEN MINI SALSEED DECORTICATOR

23. Mill scale salseed decorticator

1. Name of the machine: Salseed decorticator.

2. Purpose of the machine .. To decorticate salseed stuitable for mill scale operation.

3. Description of the machine .. It is essentially a *Kalyan* type groundnut decorticator. It consists of a roller type beater, a trough like grate with spacings and fan blower to separate the shelles and kernels. In operation the seeds fall into the trough and rolled against the grate by the revolving beater and are instantly shelled. The shells and kernels both broken and unbroken are immediately forced down through the openings in the grate on to an inclined place from where the shells are blown away by the fan. The beater made of cost iron has channel grooves on the external surface which help in rolling and decorticating the fruit. A wooden beater also functions equally effectively. The grate, which has a semi-circular shape is formed of a number of mild steel flats placed horizontally on their edges, the spacings, between each edge being adjusted to 6.35 mm. A trough made of round bars instead of flats can also be used. The fan is mounted on a steel axis which revolves on a pair of bearings at both the ends. The blades of the fan made of iron sheets are bolted to the axis The axis is fitted with a pulley on one end and it is driven by a pulley fixed at the end of the beater shaft on the same end. The other end of the beater shaft is provided with a pulley and it can be coupled to a 5 H.P. motor (1440 rpm). The beater a nd the fan are made to run at a speed of about 300 rpm.

(Same as Fig 5.)

4. Test data .. The yields are quantitative, being 66% kernels and 33% husk. The degree of decortication is 100% and the separation of husk and kernels sharp. The capacity of the machine is 20 tonnes of seed per day.

5. Economics .. The cost of the machine, Rs. 4,000.

24. A bench scale air classifier for rice bran

1. Name of the machine: Air classifier for rice bran

2. Purpose of the machine: Beneficiation of rice bran by separating sand and silica by air classification.

3. Description of the machine .. The air classifier is a conical shaped vessel made of mild steel sheet. The top of cone is connected to a 63.5 mm pipe of 1.4 metre length at the end of which a T is attached. The bottom of the cone is placed on a perforated iron plate and to this a reverse cone of 152 mm length with a bend is attached to the narrow end of the cone. A small door is provided on one side just above the perforated plate.

4. Test data .. Under simulated studies, a rice bran sample containing 18% sand and silica could be beneficiated to that containing about 6% sand and silica. The yield of beneficiated bran was 71%. The residual rice bran with 21% yield, contained 27% sand and silica. Another fraction of 8% yield was exclusively sand and silica.

5. Economics .. The cost of the machine excluding air blower, Rs. 200.

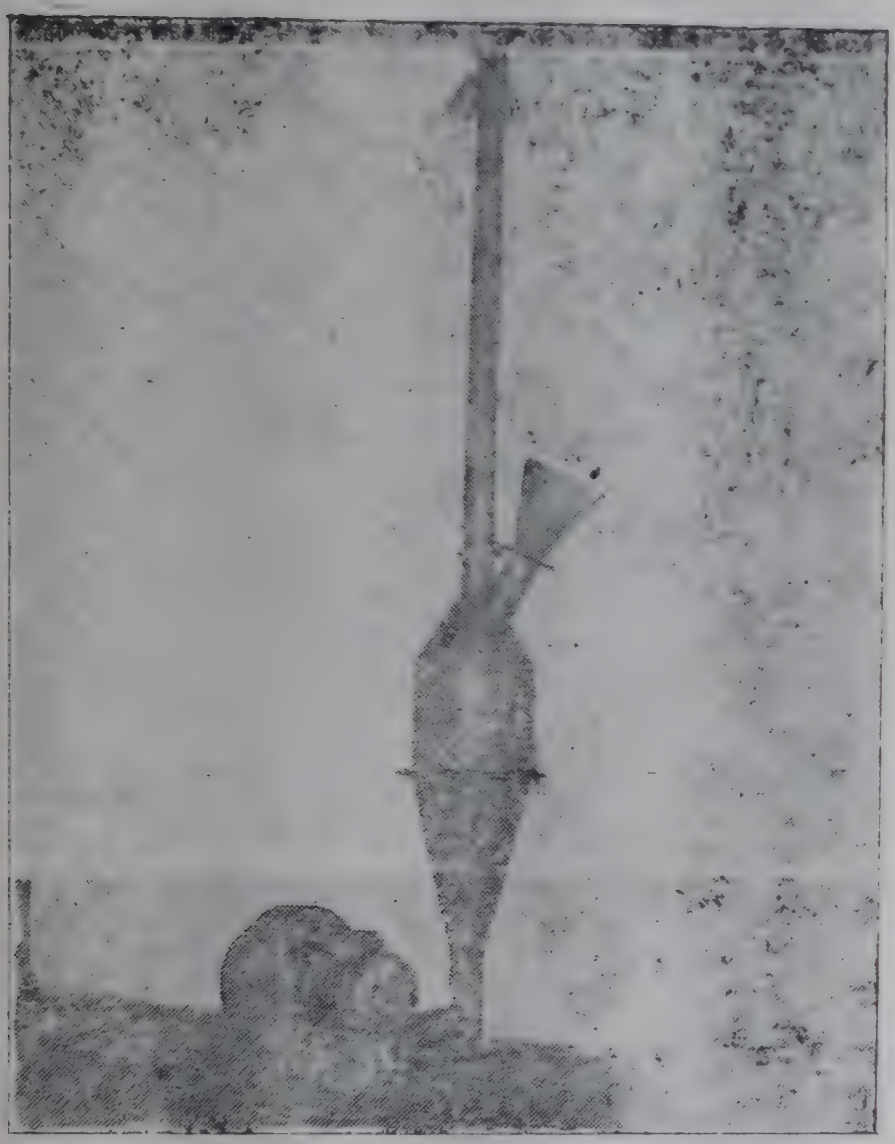

Fig 17 : A BENCh SCALE AIR CLASSIFIER FOR RICE BRAN

25. Rice bran stabilizer for rice mills

1. Name of the machine .. A batch type stabilizer for rice bran (hand operated)

2. Purpose of the machine .. To stabilize freshly produced rice bran in the rice mill itself. This machine can also be used to dry freshly harvested groundnuts, sesame seed and other grains.

3. Description of the machine .. The machine consists of a drum 93 cm in length and 50 cm in diameter made out of 22 gauge iron sheet. The drum revolves on a lever which is hand operated. Beneath the drum a perforated sheet is fixed being a provision for direct heating with firewood or charcoal. The drum is provided with a feeding hole and a hole for fixing a thermometer. At one end, a vent is provided for the escape of moisture and gases. The total capacity is 0.17 m3. The machine does not require steam or electricity and can be operated by unskilled labour.

4. Test data .. Fresh rice bran is charged and heated for 1/2 hour to 1 hour at a temperature ranging from 90 to 105° C. The free fatty acid contents of oil extracted from stabilized rice bran rose from the initial value of 2 to 4 only in seven days storage whereas the corresponding rise in the unstabilized bran was from 2 to 20. The stabilized bran keeps well upto 30 days.

5. Economics .. The cost of machine, Rs. 750.

Fig 18 : RICE BRAN STABILIZER FOR RICE MILLS

26. Continuous stabilizer for rice bran

1. Name of the machine — A continuous stabilizer for rice bran (screw conveyor type)

2. Purpose of the machine .. To stabilize freshly produced rice bran in a medium or large scale rice mill.

3. Description of the machine .. The machine consists of a tube (320 cm length and 10 cm diameter) with a screw conveyor fitted inside. A one horse power motor is coupled to the shaft in the tube through a reduction gear and pulleys to maintain the speed of the conveyor shaft from 2 to 4 rpm. The tube has a 5 Cm wide slit cut length wise on its top. This is to enable the moisture in the bran to escape. The slit is provided on either side with vertical 5 cm ridges. These are meant to prevent overflowing of moving bran. A hopper at one end and a chimney at the opposite end are provided. The top portion of tube at chimney end has suitable openings for the entry and exit of original and stabilized rice bran respectively. The tube excepting the open ridged part is embedded in a flue made of brick and mortar with an annular clearance of 2.5 cm between the bottom of the tube and of floor of the flue.

4. Test data .. The temperature maintained was 80° C The capacity of the unit was 200 to 400 kg. per day at 2 to 4 r.p.m. The FFA of the original bran initially was 3.5%. After 32 days the FFA of the stabilzed bran and original bran were 5.9 and 64.3% respectively.

5. Economics .. The cost of the equipment inculding motof and flue, Rs. 3,500. The cost o stabilization is estimated at Rs. 50 pe tonne of rice bran.

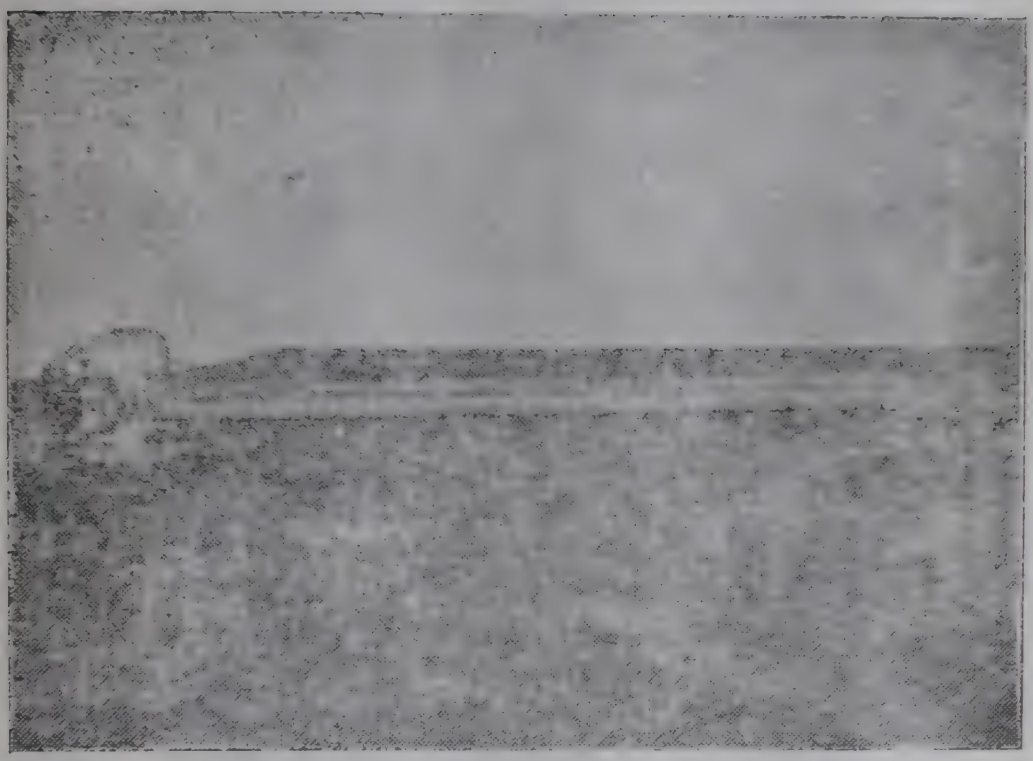

Fig 19 : CONTINUOUS STABILIZER FOR RICE BRAN

27. Mango stone decorticator

1. Name of the machine .. Mango stone decorticator

2. Purpose of the machine .. To decorticate mango stones in wet or dry condition. Mango kernels are separated from the mixture of shells and kernels obtained by decortication. Mango kernels are processed for recovery of mango kernel fat and mango kernel meal.

3. Description of the machine .. The unit consists of a chamber (38X27×20 cm) made of mild steel, in which is situated a cast-steel shaft (length 37.8 cm, diameter 7.5 cm) having a number of sturdy axe-like spikes arranged on the perimeter, the distance between two spikes being 2.5 cm. The shaft rotates at a speed of 600 r.p.m. with the help of a 1 hp motor. On one side of the chamber, a number of gaps are provided in such a way that through each gap one spike passes at any time during the rotation of the shaft if nothing is obstructing the gap. When the mango stones are present in the chamber they block the gaps, enabling the axelike spikes to slash them during their transit through the gaps. The mixture of shells and kernels then passes through an ajdustable damper underneath the chamber. The kernels are separated from the mixture by sieving through screens.

4. Test data .. Trials were made separately on wet as well as dry mango stones and the following yields were obtained.

	Wet stones per cent	*Dry stones per cent*
Kernels	54	50
Shells	40	40
Dross	6	10

The degree of decortication was 100% and the yields are quantitative. The capacity of the machine is 8 tonnes of stones per day.

5. Economics .. The cost excluding motor, Rs. 2,000

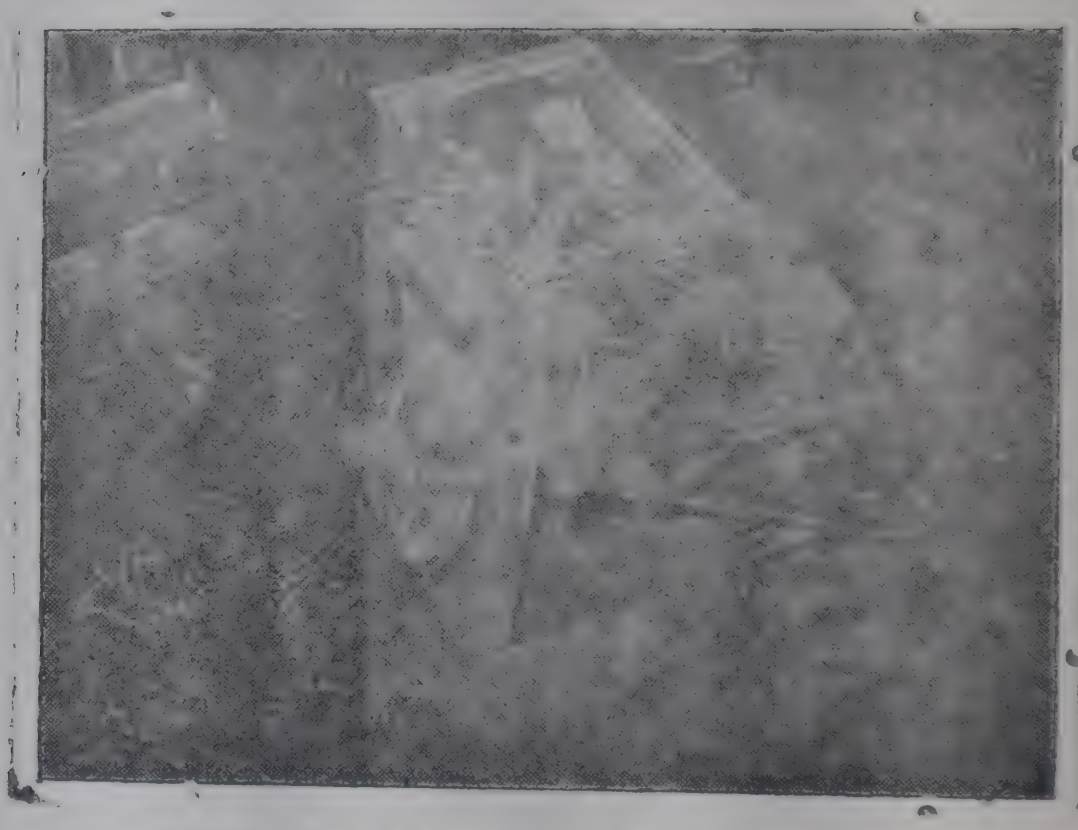

Fig 20 : MANGO STONE DECORTICATOR

28. Gokhru decorticator

1. Name of the machine : *Gokhru* (Xanthium *strumarium*) fruit decorticator.

2. Purpose of the machine .. *Gokhru* fruit has hard tenacious thorny cover which is difficult to remove. So, a small portable hand operated Gokhru seed decorticator was developed at this Institute to decorticate the Gokhru fruit after acid treatment.

3. Description of the machine .. Gokhru seed decorticator consists of two corrugated wooden discs, one is bigger in size and another disc is smaller in size. The bigger disc is stationary having 35 cm diameter and is fixed to the wooden stand and the smaller disc is rotatory having 30 cm daimeter. The fruit is fed at the centre of the stationary disc opposite to the rotary disc. The shells and kernels are forced down through the openings into bottom. The gap adjustment between stationary and rotatory disc can be adjusted. Total weight of the machine will be about 16 kg. and it is hand—operated.

4. Test data .. By soaking the thorny fruit in 2% sulphuric acid for about 10 hours and then drying in the sun for a day, the seed can be obtained easily by using this machine. Trials were made and the following yields were obtained.

Kernels ..	33%
Hulls ..	67%

The degree of decortication is 100% and the yields quantitative. The capacity of the machine is 500 kg. of fruit per day.

5. Economics .. The machine is simple in construction, modest in cost, hand operated, portable and does not need actual installation for operation. It can be fabricated at a cost of Rs. 200.

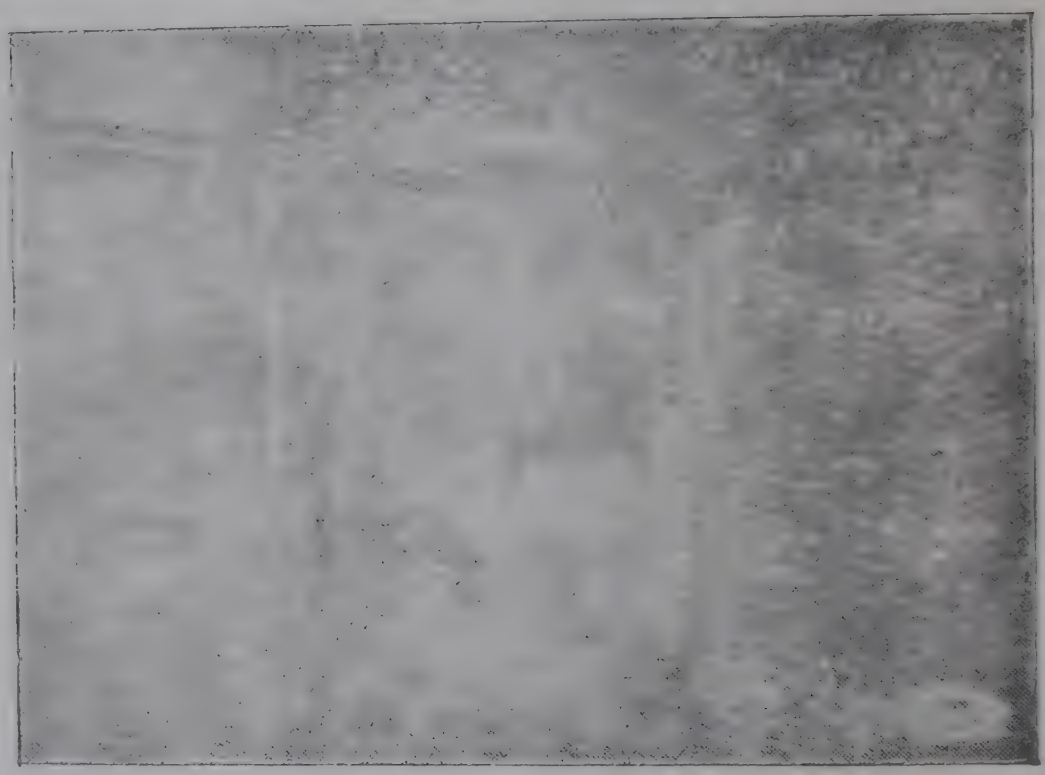

Fig 21:—GOKHRU DECORTICATOR

29. Solar dryer.

1. Name of the machine: Solar dryer

2. Purpose of the machine. For drying of oilseeds

3. Description of the machine. The unit consists of three main parts *e.g.* flat plate collector (*ii*) exhaust fan and (*iii*) bin.

(*i*) *Flat plate collector* :—It is the main part of the unit to absorb solar energy from the sun rays. Its area is 80 sq. ft. A—wooden frame is made with one side opening and this collector plate is fixed over the frame. The whole frame is erected at an angle of 14^0–40' N(latitude of Anantapur) with mild steel angle frame. On account of this angle, the sun rays will fall on the frame (collect) at 90^0. The bottom portion of the frame is also covered with ply wood sheet by opening at top and when the exhaust fan is fixed and housingis provided. The housing of the exhaust fan and the bin is connected by means of a pipe of 6" dia. While running the exhaust fan, the solar heated air passes through the housing and passes to the bin through pipe when the material is actually dried.

(*ii*) *Exhaust fan* :—The exhaust fan is of a radial flow type with low rpm. The exhaust fan is fixed in a separate housing under the collector frame at the top end. Thermometer provision is made to the connector in between the bin and exhaust fan housing to measure the temperature of the solar heated air at the inlet.

(*iii*) *Bin* :–It is constructed by bricks and cement. The size of the bin is 5'x3'–6"x2'–6' height. At the height of 6" from the bottom of the bin, a screen arranement is made to feed the material over it for drying. The dried material is removed from the discharge end of the bin.

4. Test data: .. *Blank experiment* :—The temperature rose from ambient 33.5–37^{0}C to elevated temperature of 42^0 to 46^0 C with a differential temperature of 7^0 to 10^0 C for the period tested.

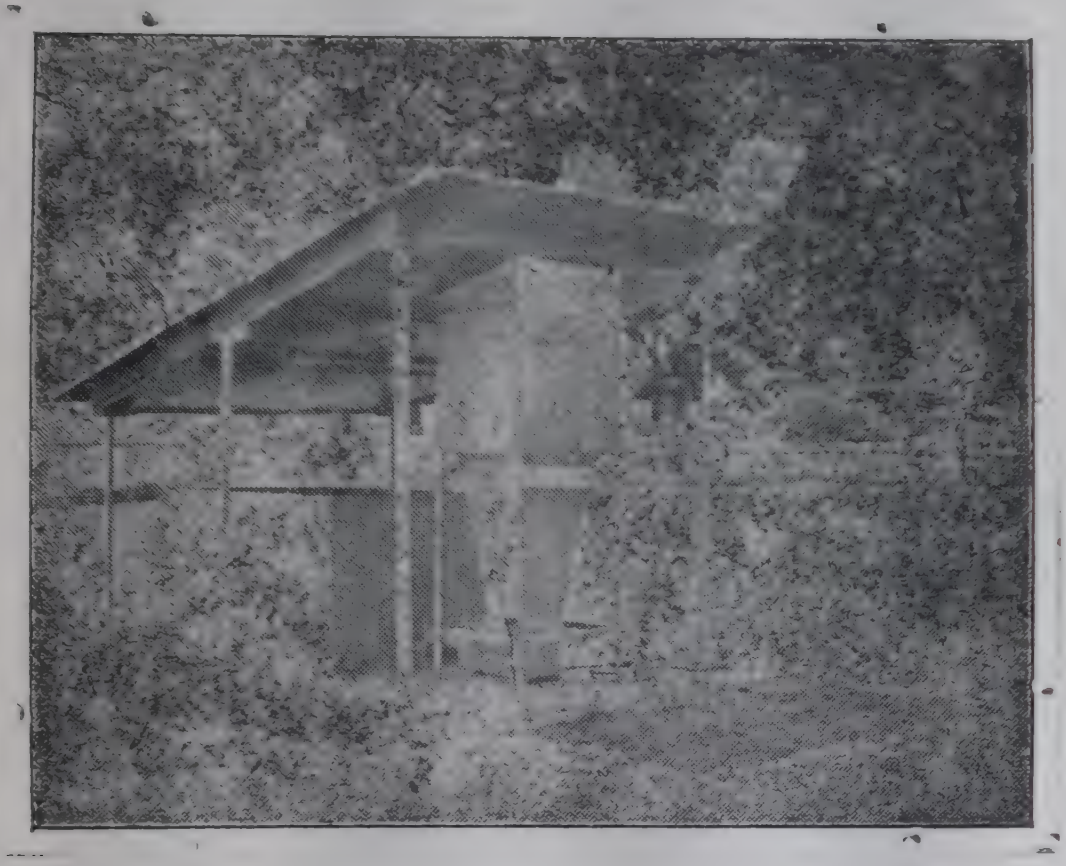

Fig 22 :—SOLAR DRYER.

30. Bench scale seed cleaner.

1. Name of the machine: Bench scale seed cleaner.

2. Purpose of the machine. .. Cleaning, sizing and grading of oilseeds and grains on bench scale.

3. Description of the machine. .. The machine is provided with inbuilt hopper. Beneath the hopper there is a provision to keep a replaceable chaff screen of suitable size. At rear side of the chaff screen, an air fan driven by motor is provided for creating a powerful air blast. The fan is connected to dust hood through a horizontal curved air column. All the light particles and dust are forced out by the air blast in the dust hood. At the bottom there is a provision to place a double screen. The double—screen can be made in a designed wooden frame with woven wire or perforated metal screen. Beneath the double screen a grain or seed discharge is provided. In operation, the chaff screen and the double screens are kept in constant vibration by a separate vibration arrangment.

4. The data .. .. The machine is versatile and can be used for cleaning, sizing and grading of all varieties of seed and grain. It is specially suited for oats, rye, barley, soybean, grass seed, peas, etc. Chaff screens and double screens of different sizes can be used to suit the purpose and hence the versatility of the machine is very high.

5. Economics. .. It is a laboratory model. About 100 kg. material can be handled in 2 to 3 hrs. The cost of the machine is Rs. 1,000 (without motor).

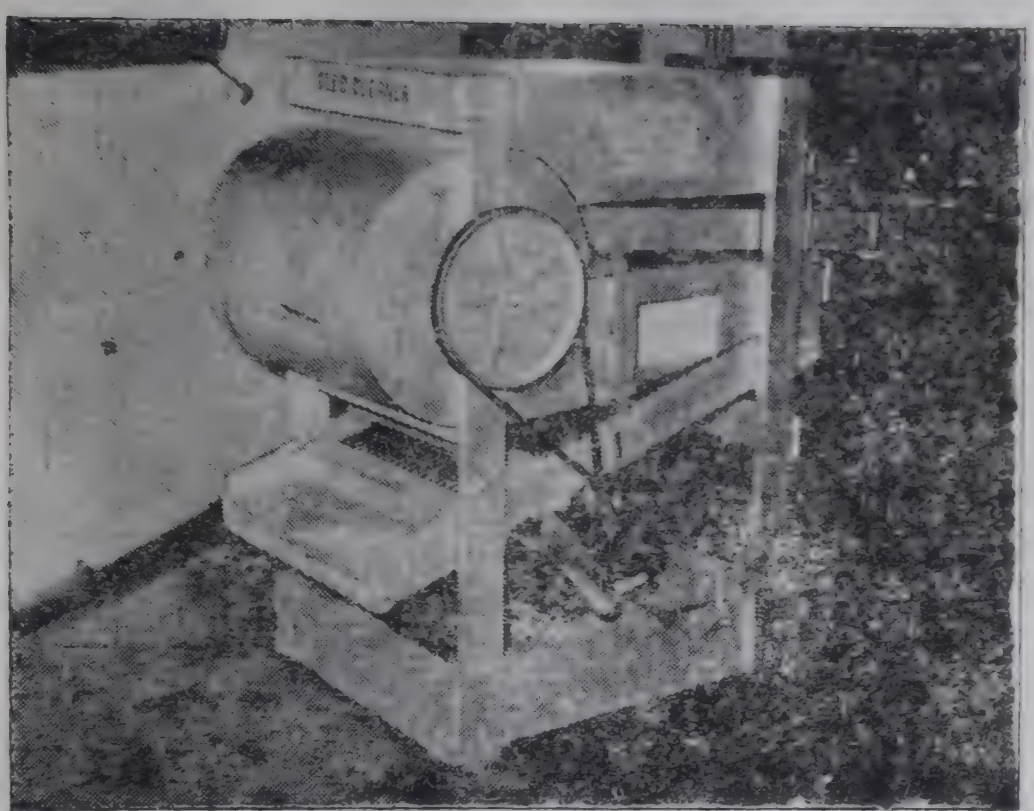

Fig 23 :—BENCH SCALE SEED CLEANER.

31. Clipper Seed Cleaner.

1. **Name of the machine:** Clipper seed cleaner.

2. **Purpose of the machine.** Cleaning of oilseeds and grains. Sizing and grading can also be done.

3. **Description of the machine.** It consists of a hopper and three replaceable screens of different sizes. The screens are kept one over the other vertically in the grooves provided for the screens. In operation, screens are vibrated constantly by a separate arrangement. Brushes of suitable sizes are provided for specific purpose of cleaning. The top screen is followed by a scalping spout and the bottom screen is followed by screening spout. Beneath the bottom screen, a powerful fan is installed to creat an air blast. The fan is connected to a dust hood through a vertical air columr.. All the light particles and dust are forced out by the air blast in the dust hood. The grain or seed discharge is provided at the bottom of the screen.

4. **Test data** .. The machine is most versatile and can be used for cleaning, sizing and grading of all types of oil-seeds and grains. Several number of screens of different sizes are provided. Screens made of perforated metal sheet or wire cloth using different sizes are used in cleaning operations.

5. **Economics** .. The capacity of the machine is 2.5 tonnes a day (in terms of cottonseed). The cost of the machine is Rs. 20,000.

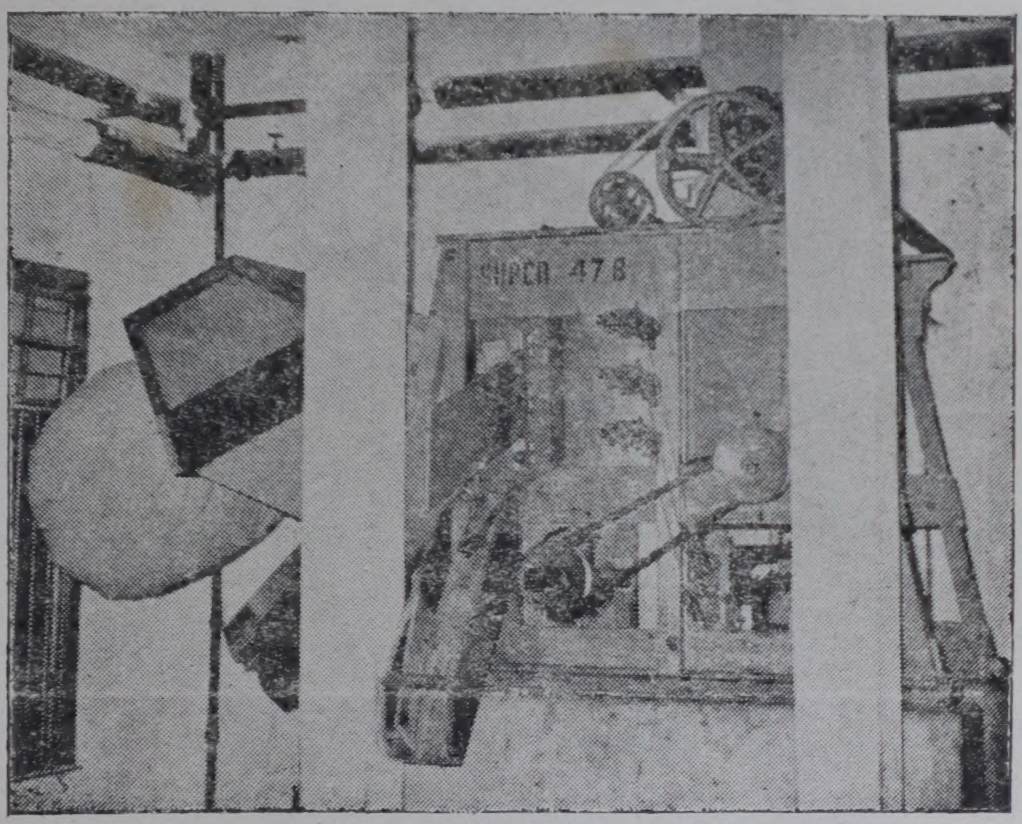

Fig 24:—CLIPPER SEED CLEANER

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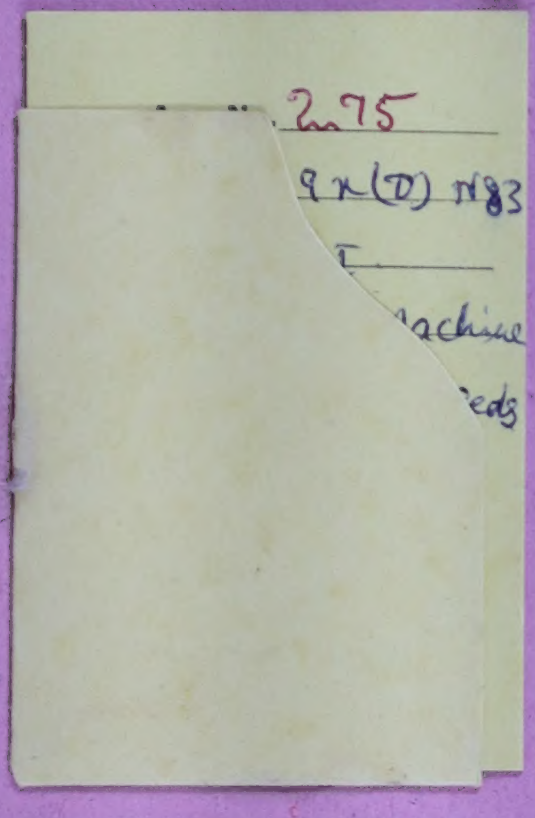
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